In the Claims

This listing of claims will replace all prior versions and listings of claims in this application.

1 (original). A noninvasive transdermal system for detecting an analyte in interstitial fluid extracted from or underneath the skin of a subject, said noninvasive transdermal system comprising:

(a) a noninvasive transdermal patch comprising a target surface having a dry chemistry component for interacting with the analyte to generate color or shade of color at said target surface, said dry chemistry component having a sensitivity which enables it to detect the analyte extracted from interstitial fluid, and

a wet chemistry component for transferring the analyte from the interstitial fluid in or underneath the skin to said dry chemistry component in an amount sufficient so that said dry chemistry component can detect the analyte; and

(b) a reflectometer comprising

a modulated light source for emitting light to illuminate said target surface which possesses a certain color and shade of color following interaction with the analyte;

an optical detector for detecting light that is reflected from said target surface and generating a first output indicative of detected light;

means for processing the first output to generate a feedback signal for application to the optical detector to compensate for any shift in the first output resulting from the detection of ambient light by the optical detector, and differentially amplify the first output to generate a second output; and

a detector for synchronously demodulating the second output to generate a substantially steady DC output voltage that is indicative of the color or shade of color at said target surface.

2 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the modulated light source of the reflectometer emits light having an intensity that varies with changes in

temperature, the reflectometer further comprising: a temperature sensor thermo-mechanically coupled to the modulated light source, the sensor generating a third output indicative of temperature of the modulated light source; and means for mathematically correcting the substantially steady DC output voltage in accordance with the third output to account for detected changes in modulated light source temperature.

3 (currently amended). The ~~reflectometer~~ system as in claim 2 wherein the modulated light source comprises at least one light emitting diode, and wherein the temperature sensor comprises a diode means having an operating characteristic substantially complementing that of the light emitting diode.

4 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the modulated light source of the reflectometer emits light having an intensity that varies with changes in temperature, the reflectometer further comprising: a temperature compensator thermo-mechanically coupled to the modulated light source; and means for having the temperature compensator control operation of the modulated light source to counteract for any variations in light intensity due to changes in modulated light source temperature.

5 (currently amended). The ~~reflectometer~~ system as in claim 4 wherein the modulated light source of the reflectometer comprises at least one light emitting diode, wherein the temperature compensator comprises a diode, and wherein the means for having comprises a series electrical connection of the diode with the light emitting diode.

6 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the modulated light source of the reflectometer emits light having an intensity that varies with changes in voltage drop across the modulated light source, the reflectometer further comprising:

a sensor for measuring voltage drop across the modulated light source during target surface illumination; and

means for mathematically correcting the substantially steady DC output voltage in accordance with the measured voltage drop to account for variations in light intensity.

7 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the optical detector of the reflectometer comprises: a photo transistor for receiving and detecting light that is reflected from the target surface and generating a first differential signal; a transistor for setting the quiescent operating point and generating a second differential signal; and means for connecting the photo transistor and transistor at a common emitter connection in a differential configuration.

8 (currently amended). The ~~reflectometer~~ system as in claim 7 further comprising a current mirror for supplying fixed constant current into the common emitter connection between the differentially connected photo transistor and transistor.

9 (currently amended). The ~~reflectometer~~ system as in claim 7 wherein the means for processing processes the second differential signal to generate the feedback signal for application to the photo transistor to bias the photo transistor to the quiescent operating point.

10 (currently amended). The ~~reflectometer~~ system as in claim 9 wherein the means for processing comprises an integrator for comparing the second differential signal to a reference voltage and integrating a result of the comparison to generate the feedback signal, wherein the feedback signal is indicative of an error between the quiescent operating point and a shift caused by DC ambient light detected at the photo transistor.

11 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the modulated light source of the reflectometer comprises: at least two light emitting diodes; and means for mounting the light emitting diodes each at an orientation angle away from an orientation angle of the optical detector so as to provide for substantially uniform illumination of the target surface with minimal specular reflection to the optical detector.

12 (currently amended). The ~~reflectometer~~ system as in claim 11 wherein the two light emitting diodes are of different color.

13 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the detector for synchronously demodulating comprises a full wave synchronous detector producing a DC voltage proportional to the peak to peak voltage of the second output signal.

14 (currently amended). The ~~reflectometer~~ system as in claim 1 further including a hand held case for containing the modulated light source, differential optical detector, differential amplifier, and synchronous detector.

15 (currently amended). The ~~reflectometer~~ system as in claim 14 wherein the target surface comprises a color developing membrane of a transdermal patch, and the hand held case includes a reader head adapted for mating with the color developing membrane of the transdermal patch.

16 (currently amended). The ~~reflectometer~~ system as in claim 15 wherein the transdermal patch includes an opening exposing the color developing membrane to view, and the reader head includes a nose configured for insertion into the transdermal patch opening.

17 (currently amended). The ~~reflectometer~~ system as in claim 16 wherein the nose of the reader head includes a transparent window for flattening the color developing membrane when the reader head is inserted into the transdermal patch opening.

18 (currently amended). The ~~reflectometer~~ system as in claim 16 wherein the opening in the transdermal patch has a certain size and shape, and wherein the nose configuration of the reader head has a complementary size and shape.

19 (currently amended). The ~~reflectometer~~ system as in claim 16 wherein the opening is circular, and wherein the nose configuration has a cylindrical shape adapted to fit within the circular opening.

20 (currently amended). The ~~reflectometer~~ system as in claim 19 wherein the cylindrical shape of the nose configuration is tapered to allow the reader head to find the circular opening.

21 (currently amended). The ~~reflectometer~~ system as in claim 1 further including a desk top case for containing the modulated light source, differential optical detector, differential amplifier, and synchronous detector.

22 (currently amended). The ~~reflectometer~~ system as in claim 21 wherein the target surface comprises a color developing testing strip, and the desk top case includes a reader site adapted for constraining the color developing test strip.

23 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the target surface color shade is indicative of a certain measurable quantity or quality, the reflectometer further comprising a processor for converting the steady DC voltage indicative of the color or shade of color at said target surface into a corresponding quantity or quality measurement.

24 (currently amended). The ~~reflectometer~~ system as in claim 23 further comprising a stored look-up table or mathematical formula correlating steady DC voltage values to corresponding quantity or quality measurements, the processor consulting the look-up table or mathematical formula in making its conversion.

25 (currently amended). The ~~reflectometer~~ system as in claim 24 wherein the measurable quantity or quality comprises an analyte concentration.

26 (currently amended). The ~~reflectometer~~ system as in claim 25 wherein the analyte concentration comprises either a glucose level or a cholesterol level.

27 (currently amended). The ~~reflectometer~~ system as in claim 1 wherein the modulated light source of the reflectometer emits light having an intensity that varies with changes in temperature, and wherein the target surface color shade is indicative of a certain measurable quantity or quality, the reflectometer further comprising: a sensor generating a temperature signal indicative of light source temperature; and a processor for correcting the steady DC voltage indicative of the color or shade of color at the target surface in accordance with the temperature signal to generate a compensated DC voltage, and for converting the compensated DC voltage into a corresponding quantity or quality measurement.

28 (currently amended). [[A]] The noninvasive transdermal system of claim 1 where said wet chemistry component is a gel.

29 (currently amended). [[A]] The noninvasive transdermal system of claim [[29]] 28 wherein said gel comprises carboxy polymethylene and propylene glycol.

30 (currently amended). [[A]] The noninvasive transdermal system of claim [[29]] 28 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

31 (previously presented). A noninvasive transdermal system for detecting an analyte in a biological fluid extracted from or underneath the skin of a subject, said noninvasive transdermal system comprising:

(a) a noninvasive transdermal patch comprising a target surface having a dry chemistry component for interacting with the analyte to generate color or shade of color at said target surface, a dry chemistry component for interacting with the analyte to detect the analyte, said dry chemistry component having a sensitivity which enables it to detect the analyte extracted from interstitial fluid, and a wet chemistry component for transferring in about 15 minutes or less the

analyte from the interstitial fluid in or underneath the skin to said dry chemistry component in an amount sufficient, so that said dry chemistry component can interact with the analyte to generate color or shade of color at said target surface for detecting the analyte, said wet chemistry component consisting essentially of a gel and a skin permeate enhancer;

(b) a reflectometer comprising a light source for emitting light to illuminate said target surface which possesses a certain color and shade of color;

an optical detector circuit for detecting light that is reflected from the target surface and generating a substantially steady DC output voltage that is indicative of the color or shade of color at said target surface;

a stored look-up table or mathematical formula correlating steady DC voltage values to corresponding quantity or quality measurements for each one of a plurality of different tests; and

a processor for consulting the stored look-up table or mathematical formula for a certain test being performed, and converting the steady DC voltage indicative of the color or shade of color at said target surface into a corresponding quantity or quality measurement in accordance with that certain test; and wherein the light source is a modulated light source and wherein the optical detector circuit comprises:

an optical detector for detecting light that is reflected from the target surface and generating a first output indicative of detected light;

means for processing the first output to generate a feedback signal for application to the optical detector to compensate for any shift in the first output resulting from the detection of ambient light by the optical detector, and differentially amplify the first output to generate a second output; and

a detector for synchronously demodulating the second output to generate the substantially steady DC output voltage that is indicative of the color or shade of color at the target surface.

32 (cancelled).

33 (currently amended). The ~~reflectometer~~ system as in claim 31 wherein the optical detector of the reflectometer comprises:

a photo transistor for receiving and detecting light that is reflected from the target surface and generating a first differential signal;

a transistor for setting the quiescent operating point and generating a second differential signal; and

means for connecting the photo transistor and transistor at a common emitter connection in a differential configuration.

34 (currently amended). The ~~reflectometer~~ system as in claim 31 wherein the means for processing processes the second differential signal to generate the feedback signal for application to the photo transistor to bias the photo transistor to the quiescent operating point.

35 (currently amended). The ~~reflectometer~~ system as in claim 31 wherein the means for processing comprises an integrator for comparing the second differential signal to a reference voltage and integrating a result of the comparison to generate the feedback signal, wherein the feedback signal is indicative of an error between the quiescent operating point and a shift caused by DC ambient light detected at the photo transistor.

36 (currently amended). The ~~reflectometer~~ system as in claim 31 wherein the detector for synchronously demodulating comprises a full wave synchronous detector producing a DC voltage proportional to the peak to peak voltage of the second output signal.

37 (currently amended). The ~~reflectometer~~ system as in claim 31 further including means for calibrating the reflectometer to each stored look-up table or mathematical formula for each one of the plurality of different tests.

38 (currently amended). The ~~reflectometer~~ system as in claim 37 wherein the means for calibrating comprises means for setting the reflectometer to read a certain DC output voltage at a mid point corresponding to a certain color or shade of color.

39 (currently amended). The ~~reflectometer~~ system as in claim 38 wherein the means for calibrating further comprises means for determining an offset for application to read DC output voltages at end points each corresponding to a certain color or shade of color.

40 (currently amended). The ~~reflectometer~~ system as in claim 38 wherein the means for calibrating further comprises means for determining an offset for application to a read DC output voltage at mid point for a certain test and corresponding to a certain color or shade of color.

41 (currently amended). The ~~reflectometer~~ system as in claim 38 wherein the means for calibrating further comprises means for determining an offset for application to read DC output voltages at end points each corresponding to a certain color or shade of color within a given batch.

42 (previously presented). The noninvasive transdermal system of claim 31 wherein the biological fluid is interstitial fluid.

43 (previously presented). The noninvasive transdermal system of claim 31 wherein the analyte is glucose.

44 (previously presented). The noninvasive transdermal system of claim 31 wherein said wet chemistry component is a gel which includes carboxy polymethylene, and said skin penetrant is propylene glycol.

45 (previously presented). The noninvasive transdermal system of claim 44 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

46 – 54 (cancelled).

55 (previously presented). A noninvasive transdermal system of claim 1 wherein the analyte is transferred in about 10 minutes or less.

56 (previously presented). A noninvasive transdermal system of claim 1 wherein the analyte is transferred in about 5 minutes or less.

57 (previously presented). The noninvasive transdermal system of claim 31 wherein the analyte is transferred in about 10 minutes or less.

58 (previously presented). A noninvasive transdermal system of claim 31 wherein the analyte is transferred in about 5 minutes or less.

59 (previously presented). A noninvasive method of detecting an analyte in a biological fluid extracted from or underneath the skin of a subject, comprising the steps of:

(a) positioning the noninvasive transdermal patch of claim 1 on the skin of the subject; and

(b) detecting the analyte with the reflectometer within about 15 minutes or less following said positioning while the noninvasive transdermal patch is positioned on the skin.

60 (currently amended). [[A]] <u>The</u> noninvasive method as in claim 59 wherein said detection occurs within about 10 minutes or less.

61 (currently amended). [[A]] <u>The</u> noninvasive method as in claim 59 wherein said detection occurs within about 5 minutes or less.

62 (currently amended). [[A]] <u>The</u> noninvasive method as in claim 59 wherein said wet chemistry component is a gel.

63 (currently amended). [[A]] The noninvasive method as in claim 62 wherein said gel comprises carboxy polymethylene and propylene glycol.

64 (currently amended). [[A]] The noninvasive method as in claim 63 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

65 (currently amended). [[A]] The noninvasive method as in claim 60 wherein said wet chemistry component is a gel.

66 (currently amended). [[A]] The noninvasive method as in claim 65 wherein said gel comprises carboxy polymethylene and propylene glycol.

67 (currently amended). [[A]] The noninvasive method as in claim 66 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

68 (currently amended). [[A]] The noninvasive method as in claim 61 wherein said wet chemistry component is a gel.

69 (currently amended). [[A]] The noninvasive method as in claim 68 wherein said gel comprises carboxy polymethylene and propylene glycol.

70 (currently amended). [[A]] The noninvasive method as in claim 69 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

71 (previously presented). A noninvasive method of detecting an analye in a biological fluid extracted from or underneath the skin of a subject, comprising the steps of:

(a) positioning the noninvasive transdermal patch of claim 31 on the skin of the subject; and

(b) detecting the analyte with the reflectometer within about 15 minutes or less following said positioning while the noninvasive transdermal patch is positioned on the skin.

72 (currently amended). [[A]] The noninvasive method as in claim 71 wherein said detection occurs within about 10 minutes or less.

73 (currently amended). [[A]] The noninvasive method as in claim 71 wherein said detection occurs within about 5 minutes or less.

74 (currently amended). [[A]] The noninvasive method as in claim 71 wherein said wet chemistry component is a gel.

75 (currently amended). [[A]] The noninvasive method as in claim 74 wherein said gel comprises carboxy polymethylene and propylene glycol.

76 (currently amended). [[A]] The noninvasive method as in claim 75 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

77 (currently amended). [[A]] The noninvasive method as in claim 72 wherein said wet chemistry component is a gel.

78 (currently amended). [[A]] The noninvasive method as in claim 77 wherein said gel comprises carboxy polymethylene and propylene glycol.

79 (currently amended). [[A]] The noninvasive method as in claim 78 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

80 (currently amended). [[A]] The noninvasive method as in claim 73 wherein said wet chemistry component is a gel.

81 (currently amended). [[A]] The noninvasive method as in claim 80 wherein said gel comprises carboxy polymethylene and propylene glycol.

82 (currently amended). [[A]] The noninvasive method as in claim 81 wherein said gel consists essentially of 1% carboxy polymethylene and 10% propylene glycol.

83 – 90 (cancelled).